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Title: On or Off?

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Santa Fe Council
ON INTERNATIONAL RELATIONS
CIR

On or Off?

Presenter

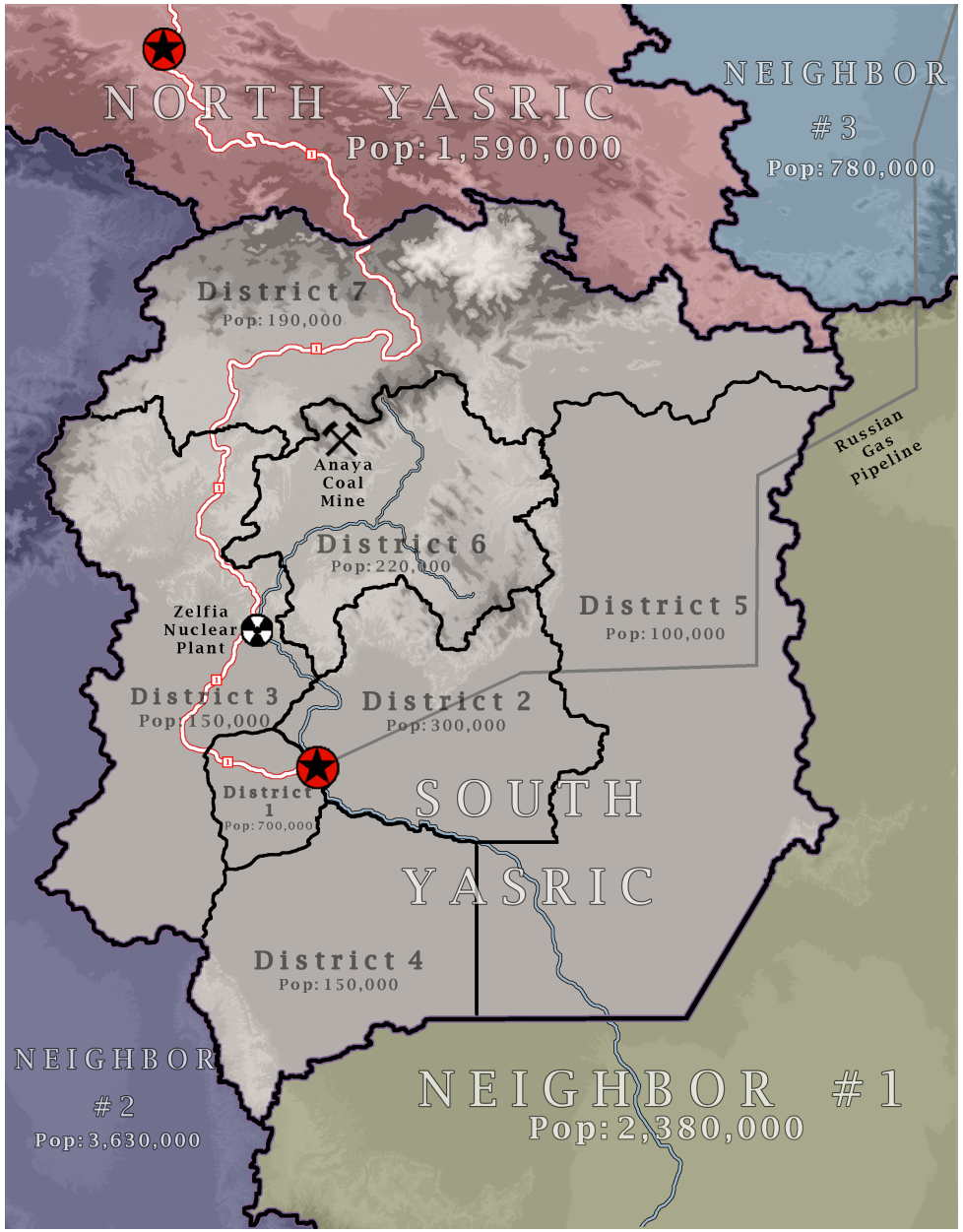
Date

Outline

- In this policy simulation you will play one of the many characters with an interest in whether the Zelfia Nuclear Power Station is turned back on or remains off.
- Your leaning outcomes are:
  - Understand the fundamentals of nuclear power
  - Understand how nuclear power might be used to accelerate a country's progress toward zero-carbon power
  - Understand the risks associated with nuclear power

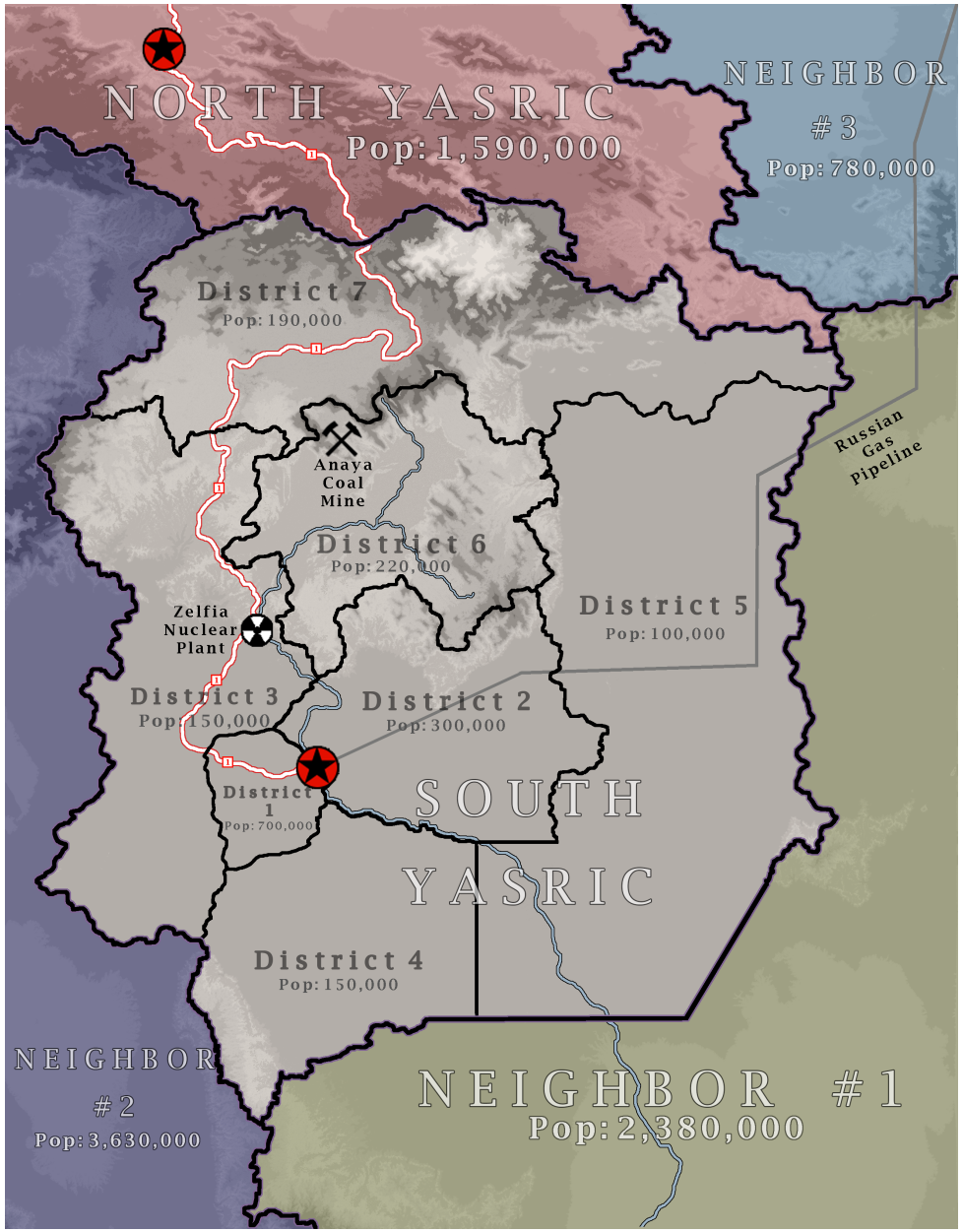
Overview

- The country of Yasric was divided by a civil war that ended 10 years ago. Today the north and south remain regional rivals.
- During the war, the Zelfia Nuclear Power Station was shut down. This left S. Yasric with an energy deficit.
- Today, S. Yasric has re-stabilized and need access to more electricity



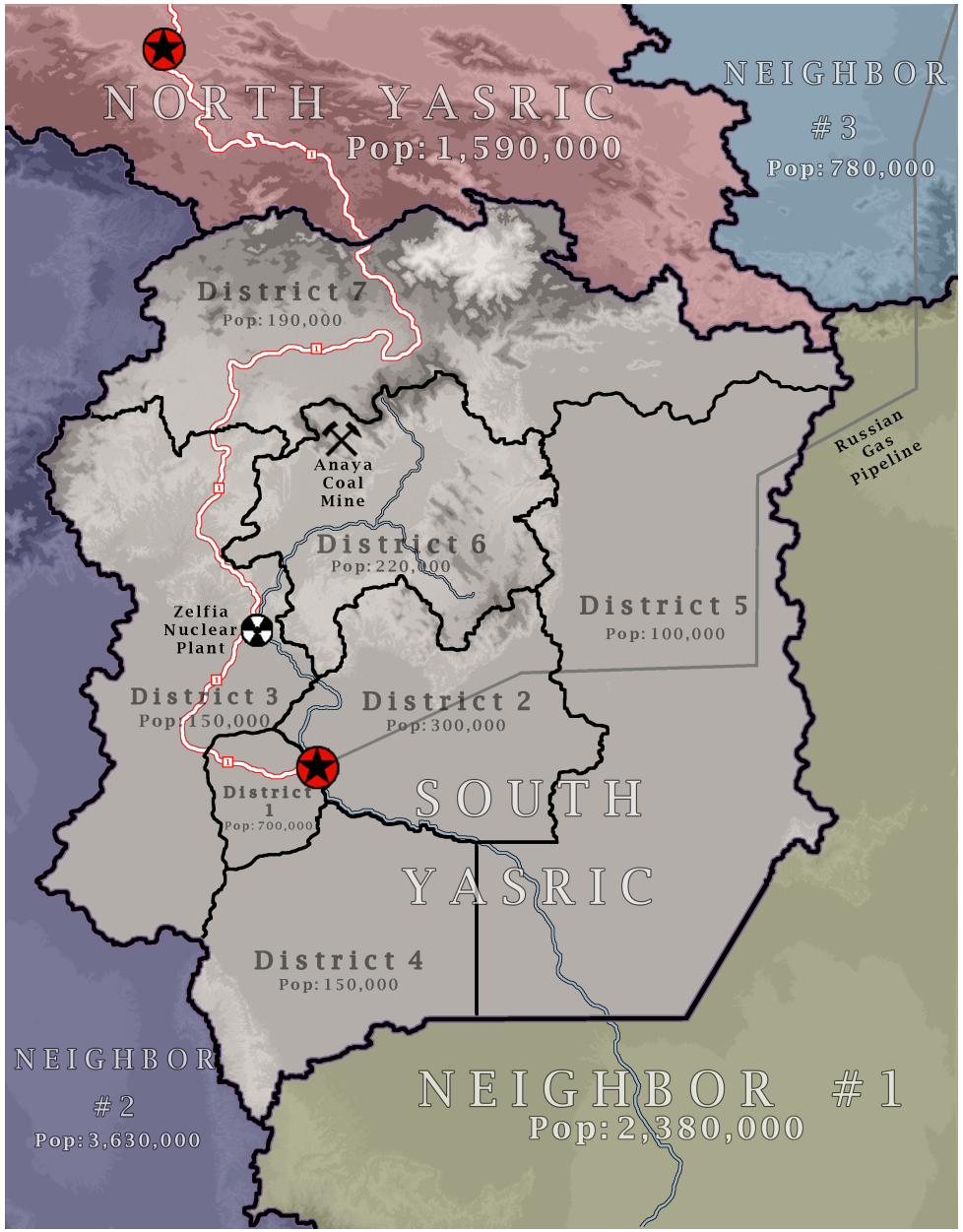
Overview

- South Yasric is boardered by North Yasric to the north. The main conflict in the region is between North and South Yasric.
- Three regional neighbor countries also have political influence in S. Yasric.



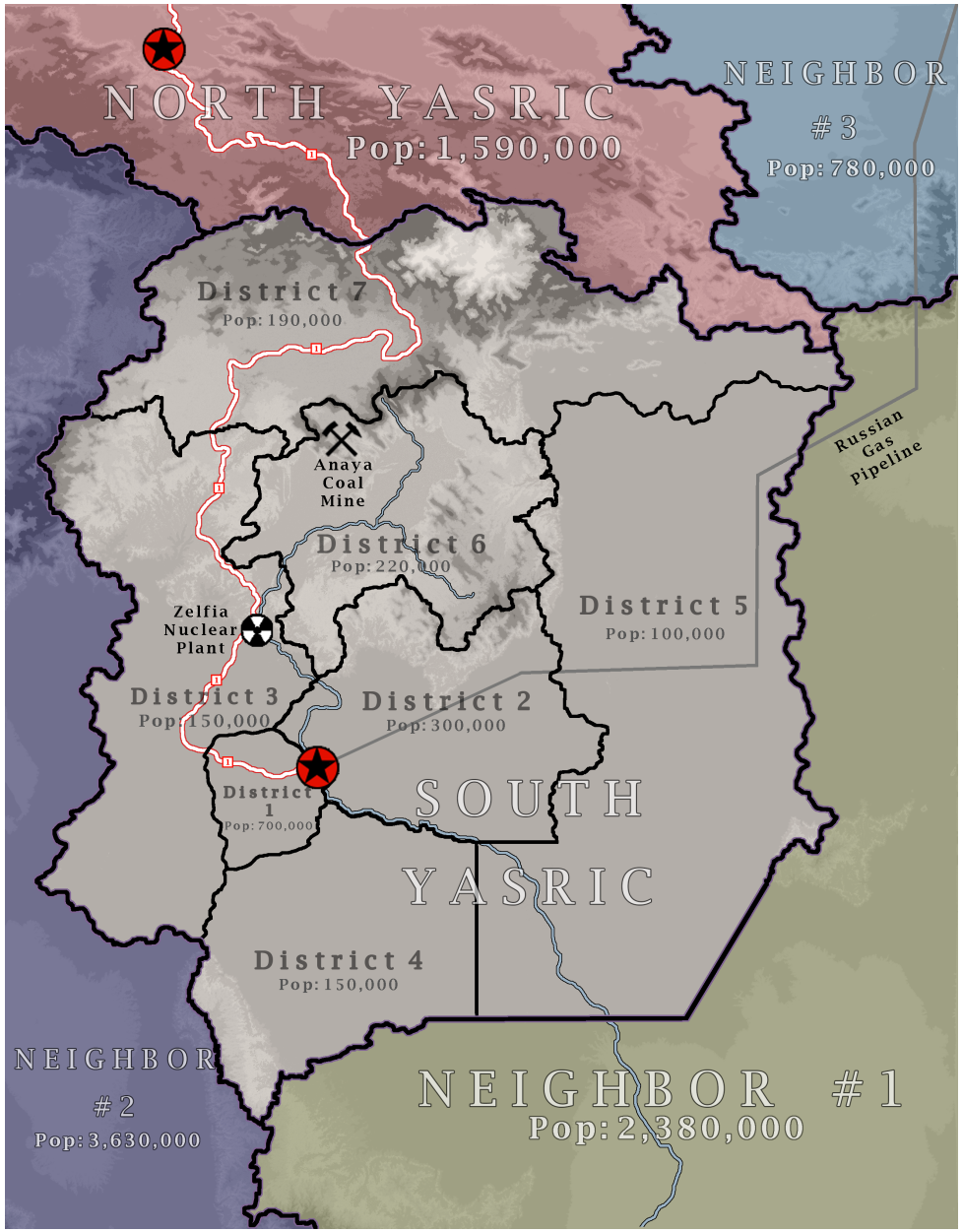
Overview

- South Yasric is divided into seven districts. Each district has a voting representative. At the end of the simulation, legislators will vote – on or off.



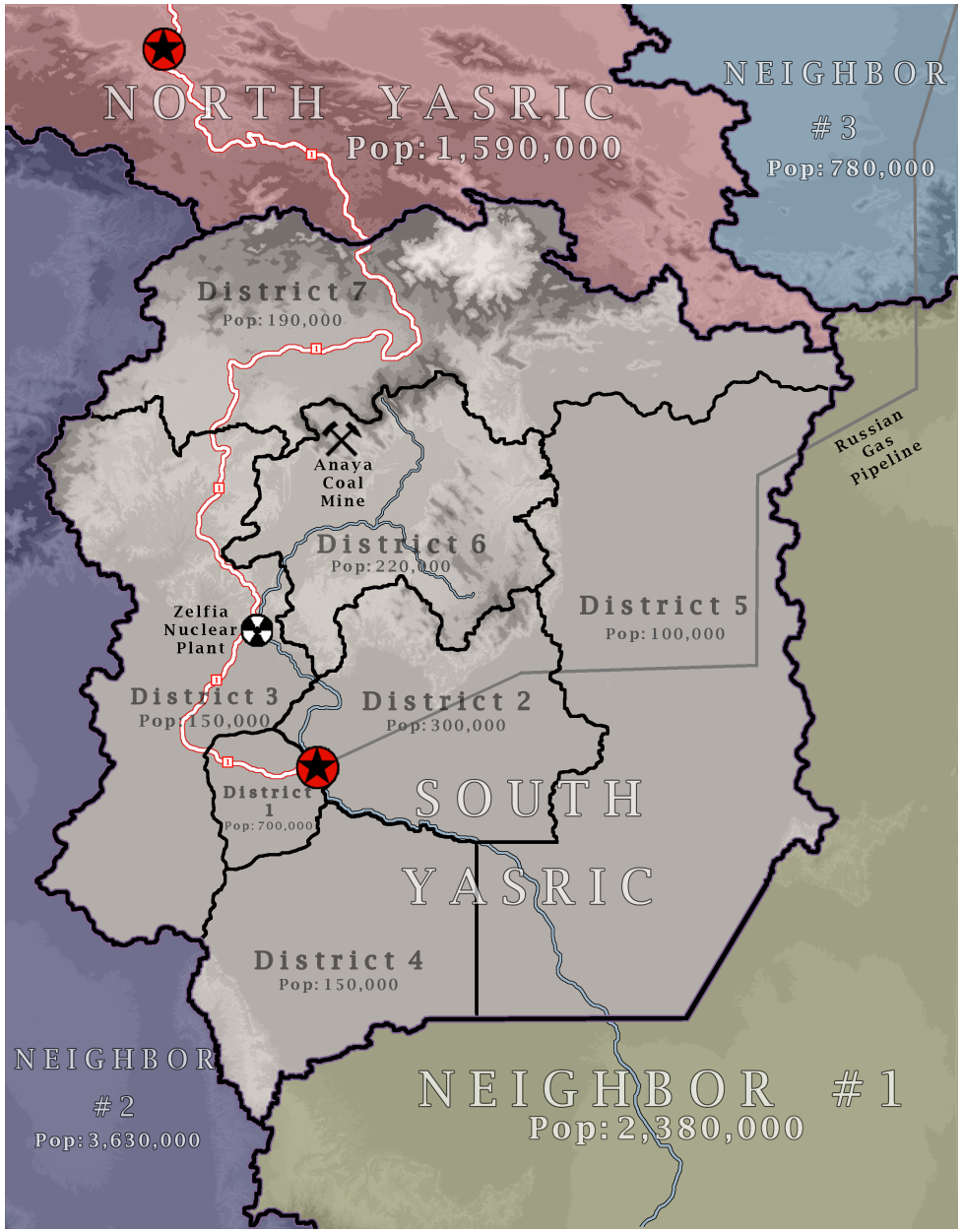
Simulation Goals

- Avoid the destruction of S. Yasric.
- Provide access to electricity to the people of S. Yasric.
- Put S. Yasric on a path to remove reliance on carbon-energy by 2030.



Individual Goals

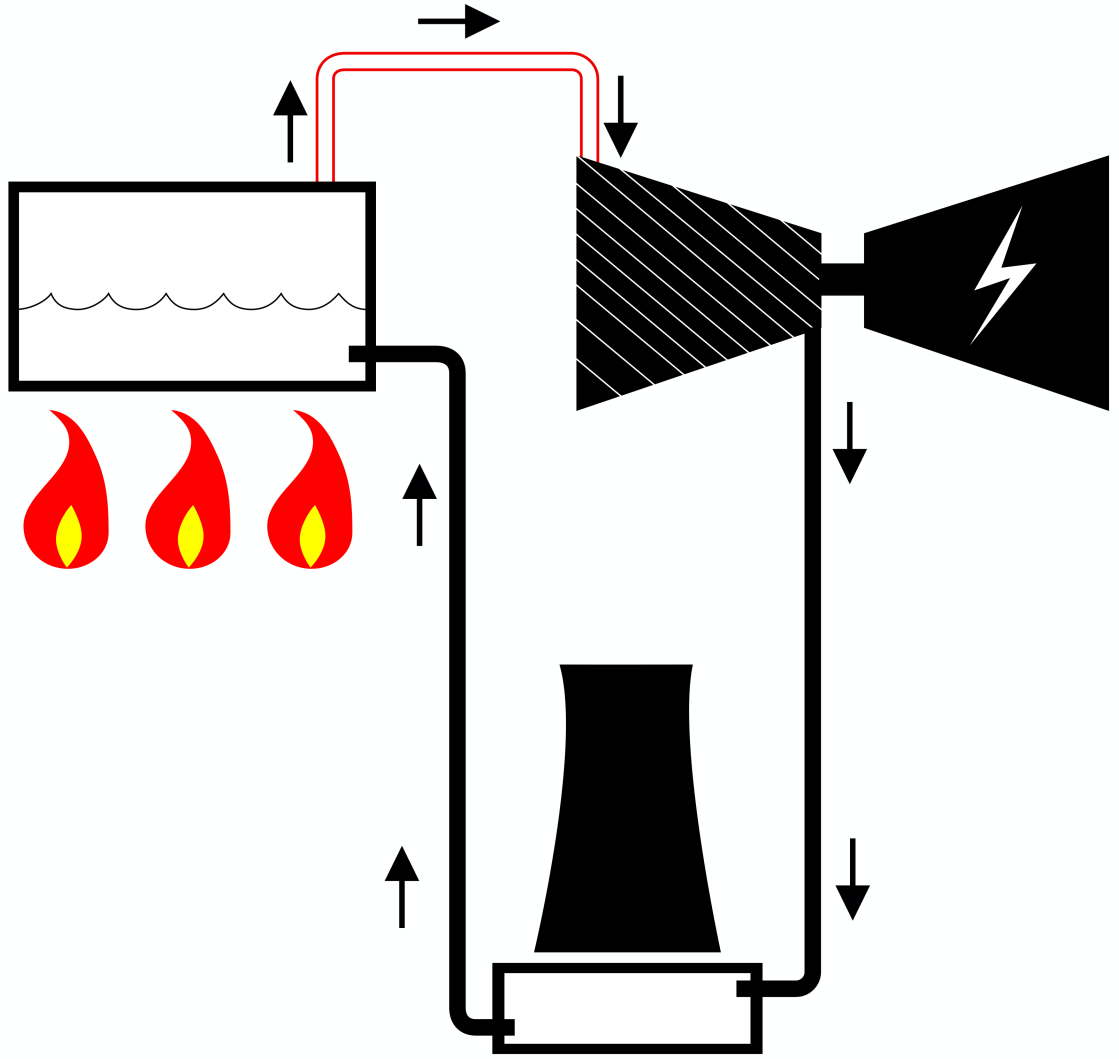
- Each individual will have goals determined by your character card. Some support turning Zelfia Nuclear Power Station back on. Others oppose it. Some don’t care.



Power Production

Fossil Fuel Power

1. Boil water
2. Steam turns turbine
3. Turbine turns generator
4. Water is cooled and returned



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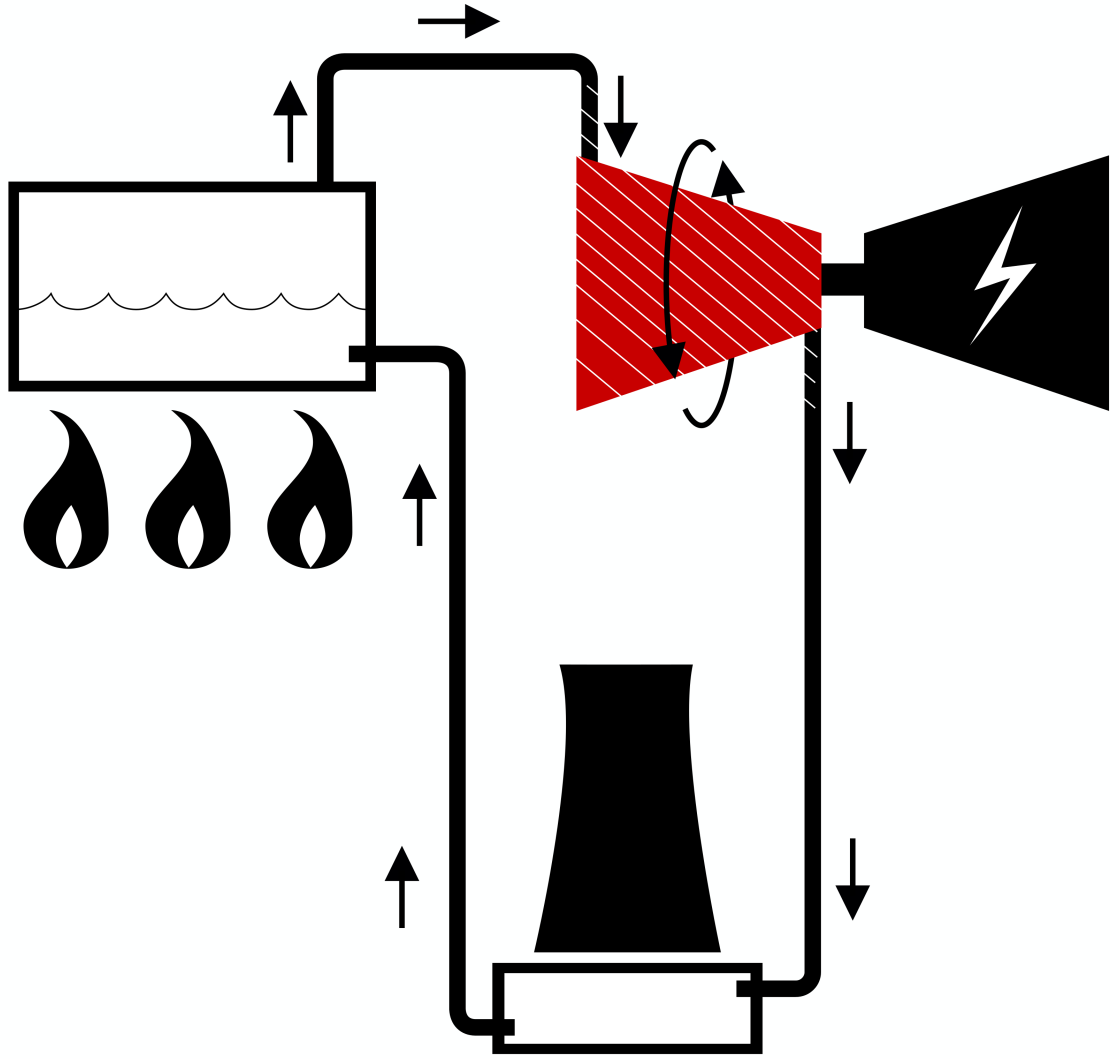

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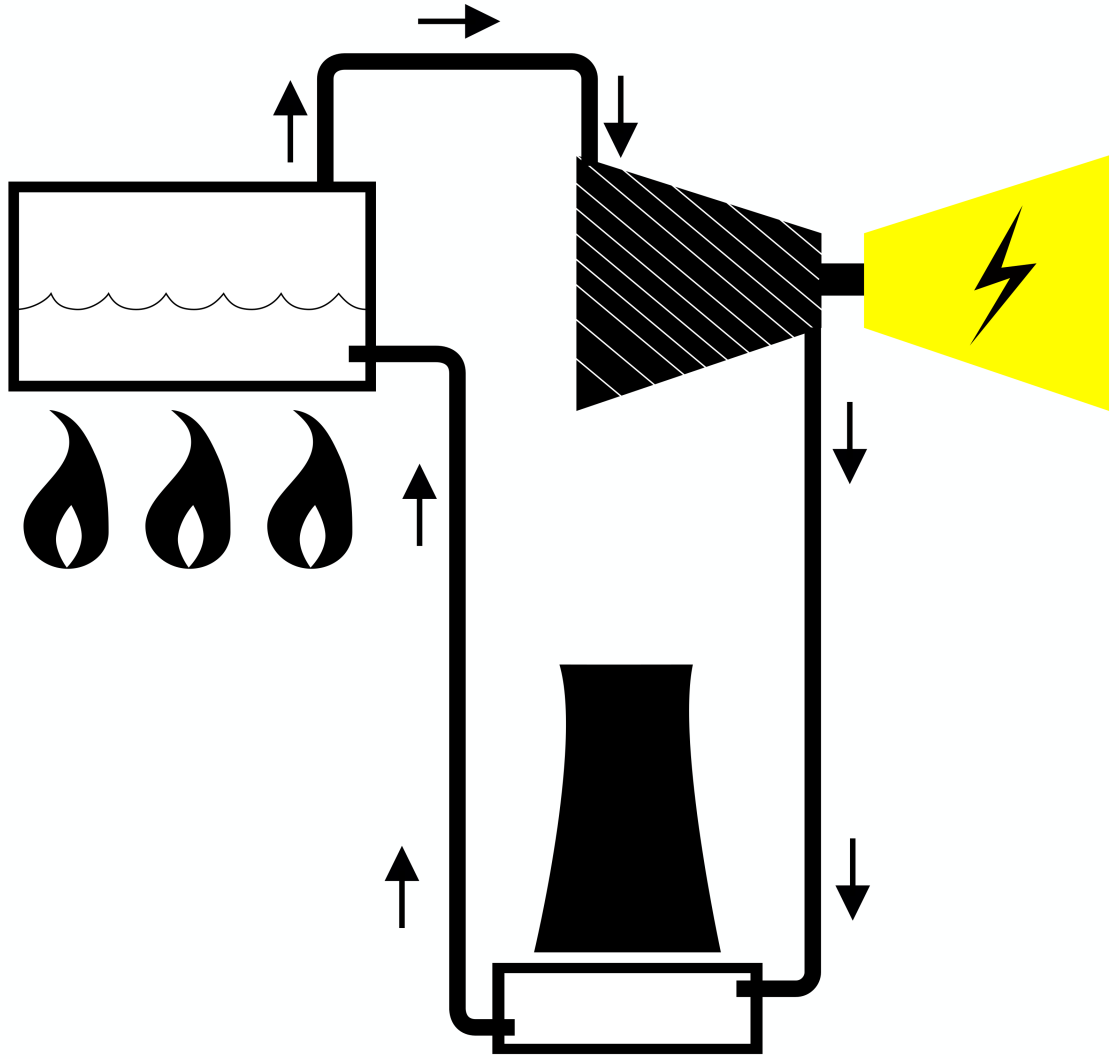

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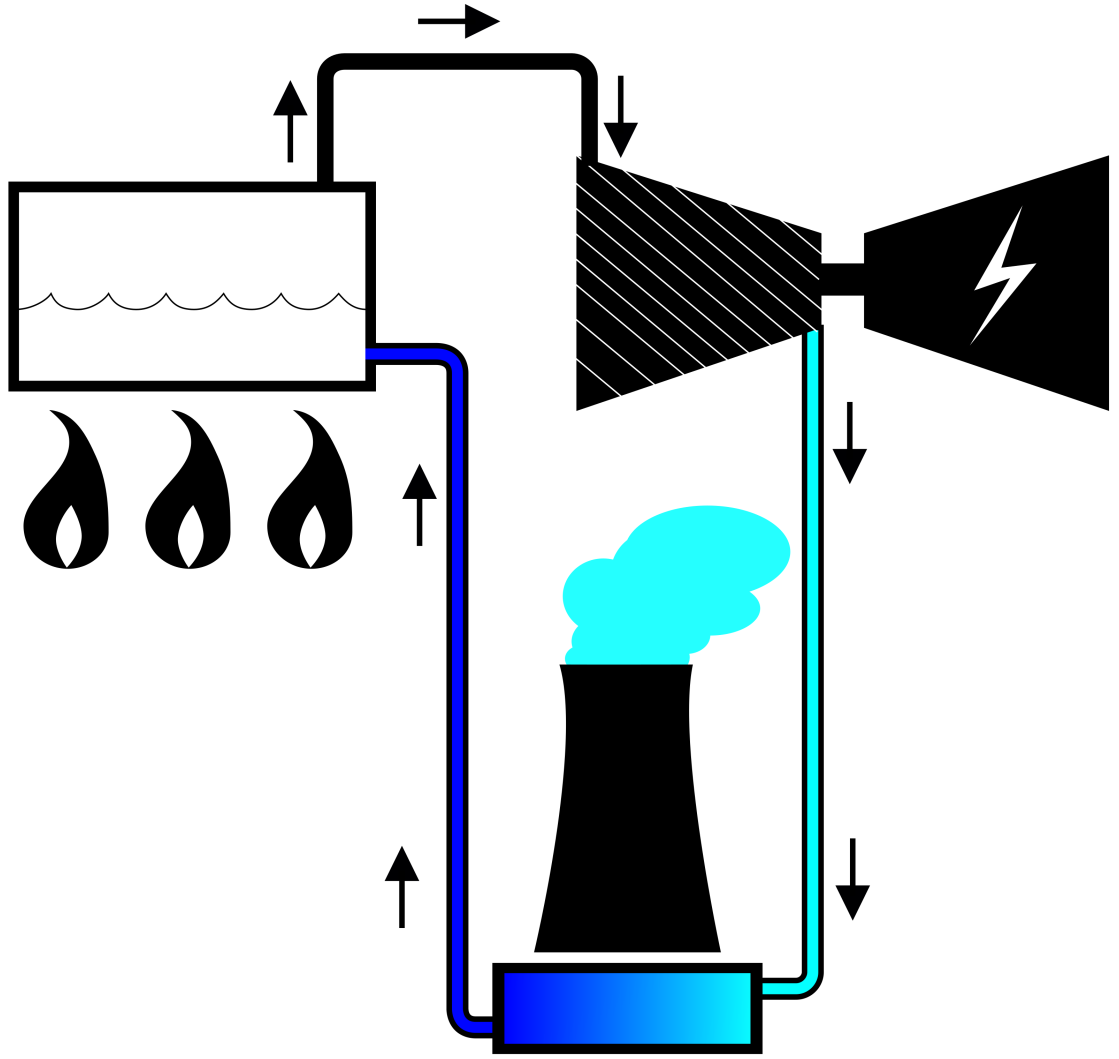

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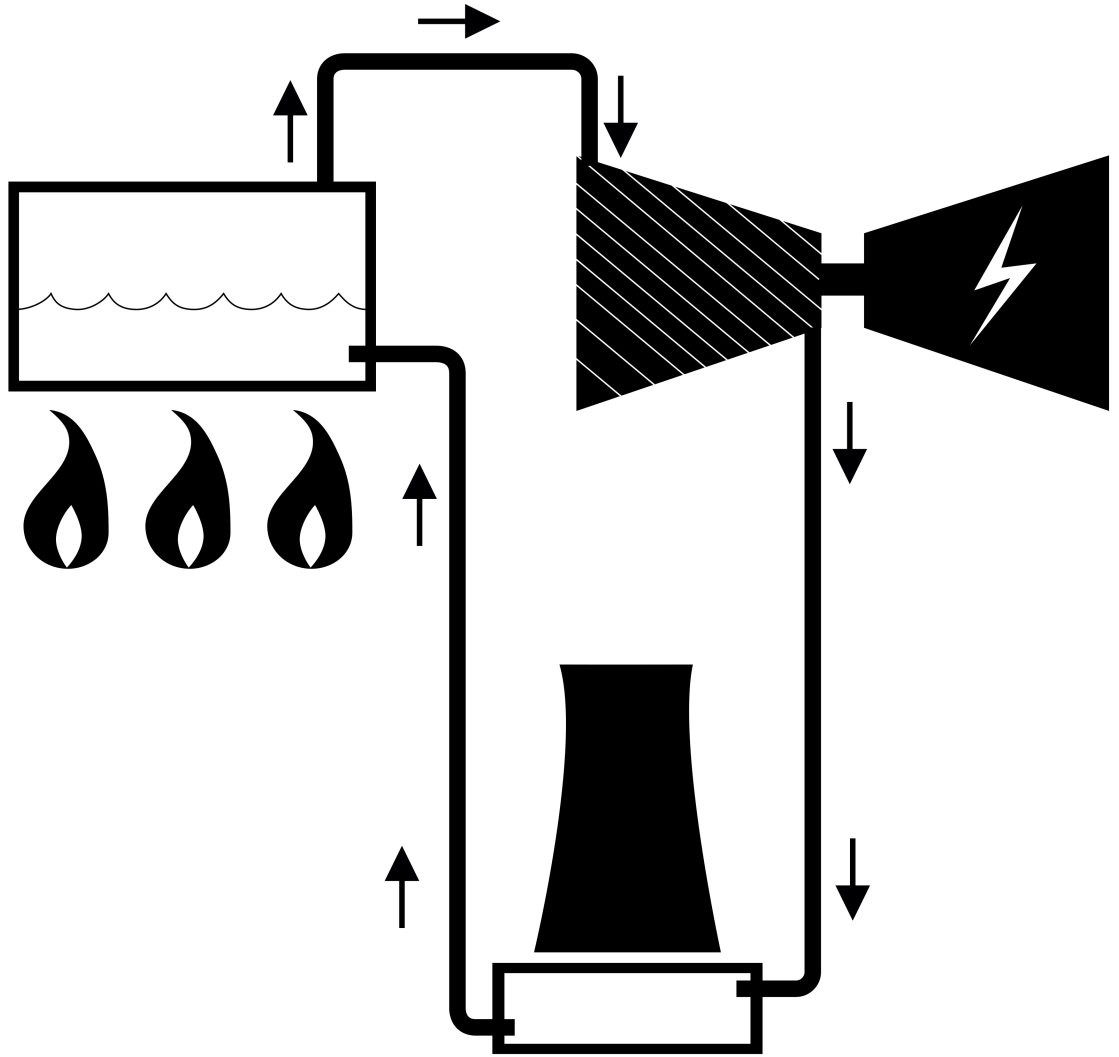

Nuclear Power

1. Boil water
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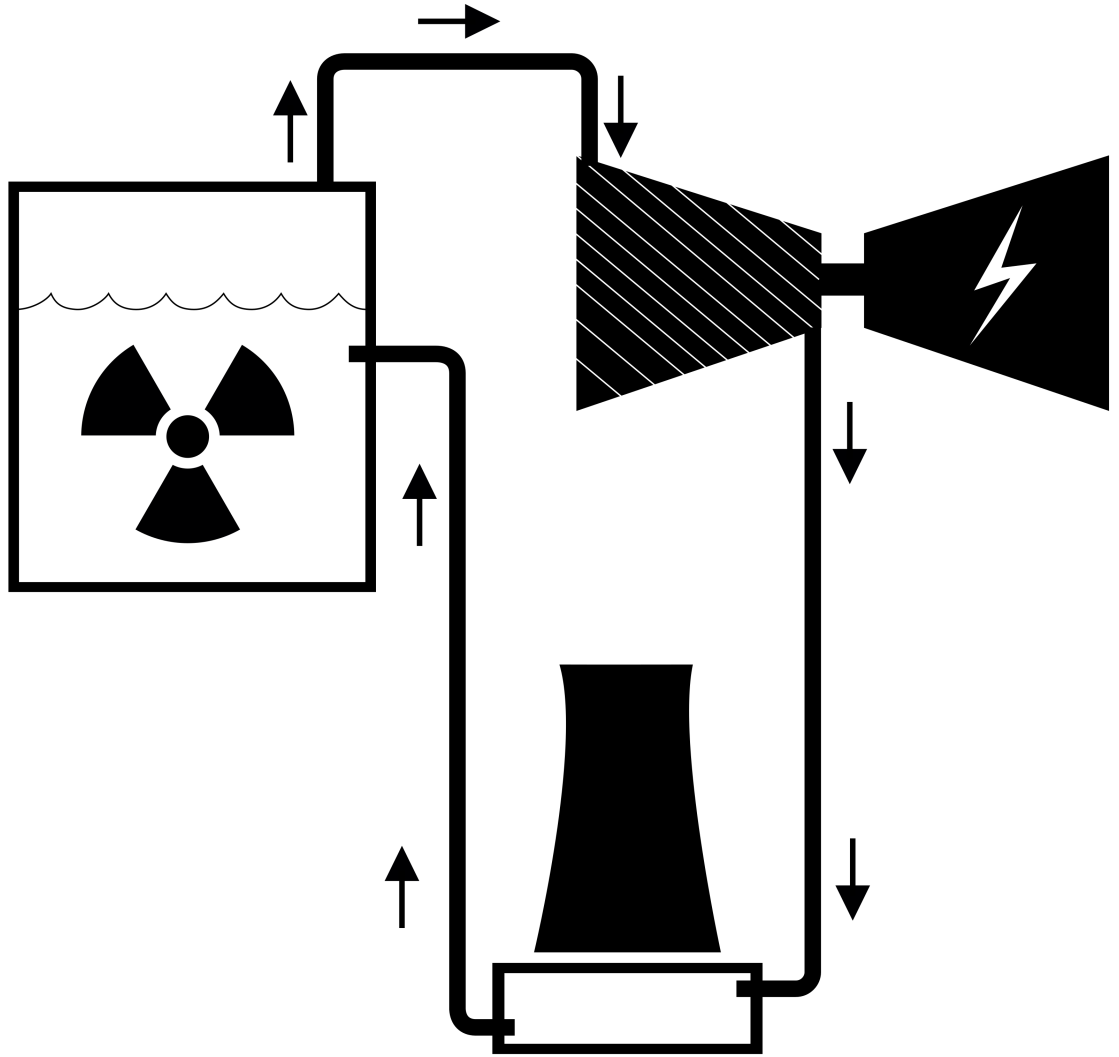
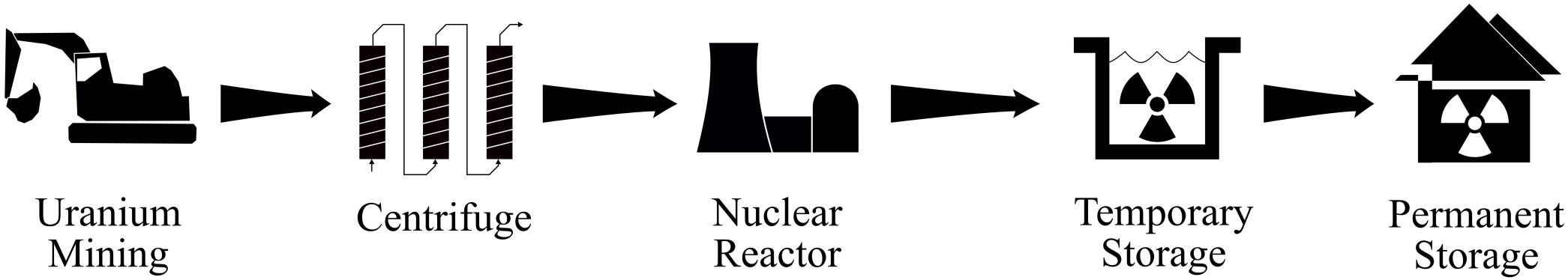


Fossil Fuel Pollution

- Almost anything can be burned to produce power
  - Coal
  - Natural gas
  - Wood pellets

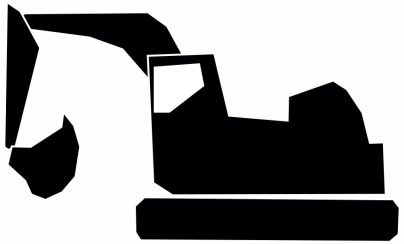
- The *chemical* burning process produces carbon dioxide and other greenhouse gases that contribute to pollution and climate change.
- Nuclear power produces no pollution from the *nuclear* burn. The only source of pollution or green house gasses is fuel fabrication and operation.

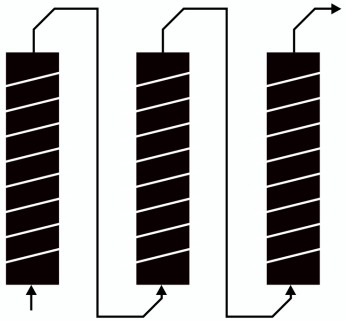
Nuclear Fuel Cycle



Fuel Preparation

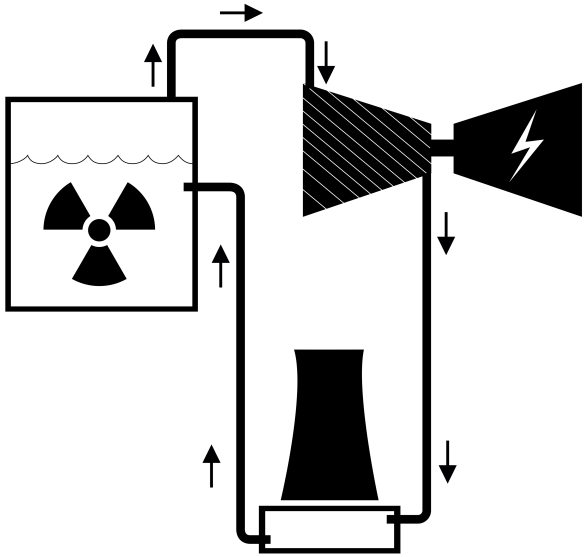
- Natural uranium is mined
  - Natural uranium is 0.7% ^{235}U and 99.3% ^{238}U
- Only the ^{235}U is useful in a nuclear reactor
- Natural uranium must be enriched to 5% ^{235}U
- ^{238}U is heavier than ^{235}U so if you spin them around very fast, the heavier ^{238}U will move to the outside



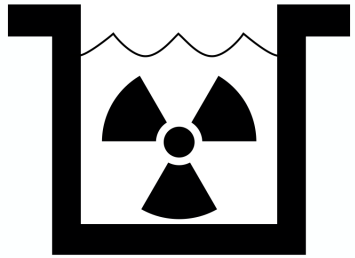


Reactor Operation

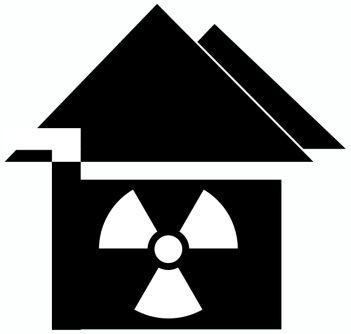
- Enriched uranium is made into fuel rods that are loaded into the reactor.
- The fuel rods make heat that is turned into electricity
- In the process the fuel rods become highly radioactive



Waste Management



- The radioactive spent fuel rods are replaced after ~4.5 years in the reactor
- The spent fuel is submerged in a spent fuel pool located next to the reactor.
- Spent fuel stays in the spent fuel pool for 10+ years.
- Eventually, spent fuel is moved to a permanent geological repository underground.
- Spent fuel remains radioactive for 1000s of years.



Nuclear Power as a Transition to Renewable Energy

The need for electricity

- Today, S. Yasric believes it is unrealistic for the country, currently dependent on coal for electricity, to transition to renewable energy within the next 2-3 decades.
  - The industrial sector will far outpace the energy supply for the forseeable future
  - The cost of installing renewable energy infrastructure could not be met without massive foreign loans that would take decades to pay off.
  - The only viable path forward for power generation is the installation of multiple natural gas generators

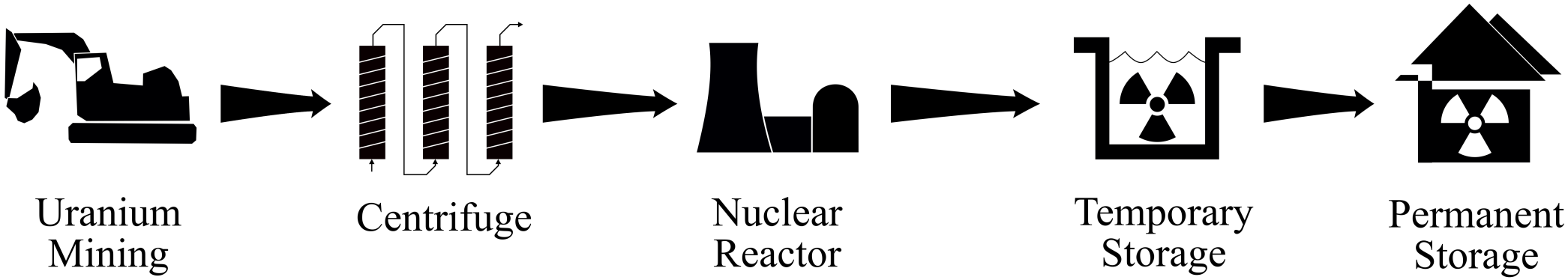
Nuclear power plants produce a lot of energy

- S. Yasric statistics
  - 2.1 million people, ~750,000 households
  - Largest city: 560,000 people
- Anaya (coal): 100 MW
- Zelfia (nuclear): 4000 MW

Nuclear Power Risks

Proliferation Concerns

- North Yasric fears that South Yasric may one day use its nuclear power program to develop a nuclear weapon to use against them
- Convincing North Yasric that this is not the case will be very challenging



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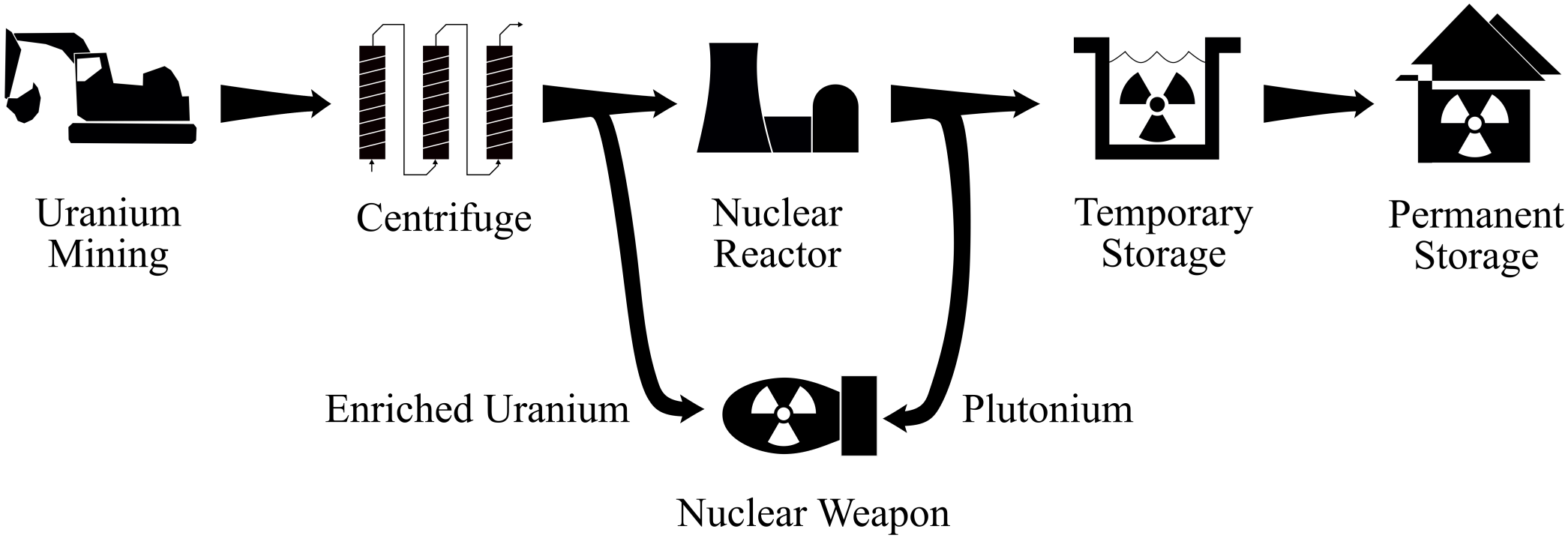

Proliferation Concerns

- Some are concerned that fuel or radioactive waste could be stolen and used for illicit purposes
- Even if the stolen fuel/waste were not used, the theft would be a major blow the the credibility of S. Yasric

Nuclear Accidents

- During normal operation, a nuclear reactor is very safe.
- In the event of a disaster (natural or otherwise), there is a risk that radioactive contamination could leak from the reactor.
- The worst scenario is that an accident leads to a meltdown.

Nuclear Accidents

- Radioactive particles are trapped in the fuel rods
- During a meltdown, the fuel rods get too hot and melt, releasing the radioactive particles
- The particles get into the air and are carried by the wind.
- People breath in these particles and can become sick from radiation poisoning. Radiation poisoning can lead to death or long-term illness such as cancer.

Long Term Environmental Concerns

- Radioactive waste has to be stored permanently
- Over time there is a risk that radioactive contamination could leak from the spent fuel containers in permanent storage.
- That radiation would seep into groundwater and contaminate people that drink it.

Summary

- You will take the role of a stakeholder in S. Yasric.
  - Your goal will be determined by the character card you receive.
- Discuss the options available.
- At the end, legislators will vote to turn the Zelfia Nuclear Power Station back on or leave it off.

Questions